but commensurate with the size of the vessel may be used and the distance apart may be correspondingly reduced.

§ 84.13 Color specification of lights.

(a) The chromaticity of all navigation lights shall conform to the following standards, which lie within the boundaries of the area of the diagram specified for each color by the International Commission on Illumination (CIE), in the ''Colors of Light Signals'', which is incorporated by reference. It is Publication CIE No. 2.2. (TC–1.6), 1975, and is available from the Illumination Engineering Society, 345 East 47th Street, New York, NY 10017 and is available for inspection at the Coast Guard, Shore Infrastructure Logistics Center, Aids to Navigation and Marine Environmental Response Product Line (CG–SILC–ATON/MER), 2703 Martin Luther King, Jr. Ave, Mailstop 7714, Washington, DC 20593–7714. It is also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html*. This incorporation by reference was approved by the Director of the Federal Register.

(b) The boundaries of the area for each color are given by indicating the corner co-ordinates, which are as follows:

(i) *White:*
x 0.525 0.525 0.452 0.310 0.310 0.443
y 0.382 0.440 0.440 0.348 0.283 0.382

(ii) *Green:*
x 0.028 0.009 0.300 0.203
y 0.385 0.723 0.511 0.356

(iii) *Red:*
x 0.680 0.660 0.735 0.721
y 0.320 0.320 0.265 0.259

(iv) *Yellow:*
x 0.612 0.618 0.575 0.575
y 0.382 0.382 0.425 0.406

§ 84.14 Intensity of lights.

(a) The minimum luminous intensity of lights shall be calculated by using the formula:

$$I = 3.43 \times 10^{6} \times T \times D^{2} \times K^{-D}$$

Where:

I is luminous intensity in candelas under service conditions,
T is threshold factor 2×10^{-7} lux,
D is range of visibility (luminous range) of the light in nautical miles,
K is atmospheric transmissivity. For prescribed lights the value of K shall be 0.8, corresponding to a meteorological visibility of approximately 13 nautical miles.

(b) A selection of figures derived from the formula is given in the following table (Table 84.14(b)):

TABLE 84.14(b)

Range of visibility (luminous range) of light in nautical miles D	Minimum luminous intensity of light in candelas for K = 0.8 I
1	0.9
2	4.3
3	12
4	27
5	52
6	94

§ 84.15 Horizontal sectors.

(a)(i) In the forward direction, sidelights as fitted on the vessel shall show the minimum required intensities. The intensities shall decrease to reach practical cut-off between 1 and 3 degrees outside the prescribed sectors.

(ii) For sternlights and masthead lights and at 22.5 degrees abaft the beam for sidelights, the minimum required intensities shall be maintained over the arc of the horizon up to 5 degrees within the limits of the sectors prescribed in Rule 21 (§ 83.21 of this chapter). From 5 degrees within the prescribed sectors the intensity may decrease by 50 percent up to the prescribed limits; it shall decrease steadily to reach practical cut-off at not more than 5 degrees outside the prescribed sectors.

(b) All-round lights shall be so located as not to be obscured by masts, topmasts or structures within angular sectors of more than 6 degrees, except anchor lights prescribed in Rule 30 (§ 83.30 of this chapter), which need not be placed at an impracticable height above the hull, and the all-round white light described in Rule 23(e) (§ 83.23(e) of this chapter), which may not be obscured at all.

(c) If it is impracticable to comply with paragraph (b) of this section by exhibiting only one all-round light, two all-round lights shall be used suitably

positioned or screened to appear, as far as practicable, as one light at a minimum distance of one nautical mile.

NOTE TO PARAGRAPH (c): Two unscreened all-round lights that are 1.28 meters apart or less will appear as one light to the naked eye at a distance of one nautical mile.

§ 84.16 Vertical sectors.

(a) The vertical sectors of electric lights as fitted, with the exception of lights on sailing vessels underway and on unmanned barges, shall ensure that:

(i) At least the required minimum intensity is maintained at all angles from 5 degrees above to 5 degrees below the horizontal;

(ii) At least 60 percent of the required minimum intensity is maintained from 7.5 degrees above to 7.5 degrees below the horizontal.

(b) In the case of sailing vessels underway, the vertical sectors of electric lights, as fitted, shall ensure that:

(i) At least the required minimum intensity is maintained at all angles from 5 degrees above to 5 degrees below the horizontal;

(ii) At least 50 percent of the required minimum intensity is maintained from 25 degrees above to 25 degrees below the horizontal.

(c) In the case of unmanned barges the minimum required intensity of electric lights as fitted shall be maintained on the horizontal.

(d) In the case of lights other than electric lights these specifications shall be met as closely as possible.

§ 84.17 Intensity of non-electric lights.

Non-electric lights shall so far as practicable comply with the minimum intensities, as specified in the Table 84.14(b).

§ 84.18 Maneuvering light.

Notwithstanding the provisions of § 84.02(f), the maneuvering light described in Rule 34(b)(§ 83.34(b) of this chapter) shall be placed approximately in the same fore and aft vertical plane as the masthead light or lights and, where practicable, at a minimum height of one-half meter vertically above the forward masthead light, provided that it shall be carried not less than one-half meter vertically above or below the after masthead light. On a vessel where only one masthead light is carried the maneuvering light, if fitted, shall be carried where it can best be seen, not less than one-half meter vertically apart from the masthead light.

§ 84.19 High-speed craft.

(a) The masthead light of high-speed craft may be placed at a height related to the breadth of the craft lower than that prescribed in § 84.02(a)(i), provided that the base angle of the isosceles triangle formed by the sidelights and masthead light, when seen in end elevation is not less than 27°.

(b) On high-speed craft of 50 meters or more in length, the vertical separation between foremast and mainmast light of 4.5 meters required by § 84.02(k) may be modified provided that such distance shall not be less than the value determined by the following formula:

$$y = \frac{(a + 17\Psi)C}{1000} + 2 \ ;$$

Where:

y is the height of the mainmast light above the foremast light in meters;

a is the height of the foremast light above the water surface in service condition in meters;

Ψ is the trim in service condition in degrees;

C is the horizontal separation of masthead lights in meters.

NOTE TO § 84.19: Refer to the International Code of Safety for High-Speed Craft, 1994 and the International Code of Safety for High-Speed Craft, 2000.

§ 84.20 Approval.

The construction of lights and shapes and the installation of lights on board